

## COMPETITION EXPERIENCE, RELATIVE AGE EFFECT AND AVERAGE AGE OF THE SENIOR WORLD EVENTS' MEDAL-WINNING BASKETBALL PLAYERS

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**ABSTRACT.** The International Basketball Federation (FIBA) has changed its youth competition system in 2004, and due to this regulation, many players had the chance to compete every year at youth level and later, to elevate to the top. The purpose of our study was to inspect those medal-winning European basketball players who competed in the past 19 senior basketball world events. We analysed the tendencies of selection by dissecting the set-up of successful senior national teams. We investigated each one of the 281 European basketball players who won a medal during the analysed period (2000-2019). We collected data from the archive page of FIBA. Our goal was to see whether there was a relation between the youth competition experience and the minutes spent in senior world events. We used the Cramer Association Coefficient, Relative Age Effect and average age were also inspected. We found that participation in the national youth tournaments is important but not the most exclusive factor of selection. There are opportunities for success in the adult national teams for players who have covered alternative sports careers – the factor of national youth experience is not exclusive. We suppose that head coaches utilize older and more experienced players on the Olympic Games, the average ages of successful Olympic medal-winner teams are higher than other world events' medallists. Despite the fact that we were not able to find statistically proven and associative relationship between national youth recruitment eligibility and the minutes in game spent by successful adult players, further research could be gap fillers in exploring key factors in adulthood efficiency.

**Keywords:** *talent selection, competition experience, FIBA, basketball players, sport career.*

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## Introduction

The sport sector utilizing its own economic potential has gained global proportions nowadays. Due to the media broadcasting there are more and more people start practising sports, and more and more spectacular sports appear on the horizon. Besides the micro sized and national competitions there are international championships organized, nations compete with each other for the sake of fame, and the envisioned economic benefits in a direct (in case of sport businesses) or in an indirect way (in case of national economic advantages through national teams). Professional sport has increased to such a level that demands the use of the newest techniques of selection and training methods. Therefore, there are younger and younger sportsmen appearing in the international competitions (Wiersma, 2000.).

There is great competition in the development of selection efficiency in the different sports in and out of the playing areas. The cornerstone of sport science is the exploration and understanding of factors that affect exceptional performance the most (Starkes and Ericsson, 2003; Baker and Farrow, 2015). For building and maintaining a competitive advantage it is constantly necessary to learn the latest knowledge and put it into practice. Using the toolbar of science, earlier research examined how much results and competitions define performance in the future. Can future results be predicted based on the past?

According to Baker et al (2017), the field of talent selection is based on the hypothesis that in the early period of a sportsman's development performance appears as an indicator of the sportsperson's future potential. Barreios et al. (2014) did not find any correlations between success achieved in the recruitment period and efficiency in adulthood. Inspecting rugby players, Till et al (2015) doubted the efficiency of talent selection at an early age. However, opposing their results, Harsányi (2009) doing research among athletes found that 'contest performance of athletes, who are successful at the leading edge international standards, could be a selection indicator especially if other factors confirm it (e.g. shape, psychological, social and/or training method factors)'. Schumacher et al. (2006) state that those cyclists who had taken part in the junior world championships were more successful as adults than those who had not had that opportunity. More research confirmed the point of view saying that exceptional individual performance in the recruitment can increase success in adulthood. Brouwers et al. (2012) and Pereira et al. (2014) ended up with similar result in gymnastics and tennis. Moxley and Towne (2015) found that one of the predictive systems that can be most easily localized among basketball players playing in the NBA is the players' universities; players coming from universities conferring high prestige basketball had better performance in the elite league.

This article is not intended to decide on forecasting only wishes to give a mental framework by analysing a team sport, basketball, from the viewpoint of sport competitive experience. The research aims at the analysis of the world competitions of the sport for the past twenty years with the intention of having objective and measurable data in connection with the player content of successful national teams and observing the different tendencies. We would also like to find an answer to the question: is experience in international recruitment competitions an indispensable condition for successful performance in adulthood?

## **Methods**

Traditionally we take the medals, records, and victories as the measure of success in sport (Penney, 2000). We took the first, second and third placements as the subject of our research as a measure to analyse the relationship between adult success and participation in youth recruitment tournaments. We analysed the period starting from the Olympic Games in Sydney in 2000 to the world championship in China in 2019. In these 20 years there were 19 European championships, world championships and Olympic games organized by FIBA: 5 world cups and Olympic games respectively and 9 European continental championships. It is worth emphasizing that the subject of this research were the sportsmen of European national squad players. We analysed only those teams who achieved first, second or third placements in this period.

The most successful national basketball team with world-power is the squad of the USA, that gained 4 golden medals in the last 5 Olympic games. With its diverse and unique competition system it could become the focus of a next research, however, presently, we are taking the teams whose competition system is defined and monitored by FIBA Europe into consideration. In the 19 events the medals were distributed among 12 nations. 10 out of 12 countries were European and this concentrated distribution of medals confirmed our scope of interest. During the research we looked at team squads of 684 people altogether, based on the free to use archive pages of the webpage of FIBA on the Internet. After data organization the number of players with actual number of medals reduced to 281 people since there were more players in the national squads who performed repeatedly in the different basketball world events.

In 2004, there was a substantial alteration of the competition system of FIBA and instead of the European youth championships organized bi-annually there were series of competitions introduced with different names – called as U16, U18 and U20 European Championships – that were organized annually. Instead of the previous cadet, junior and senior age groups you could find the

above-mentioned age groups. An important stage of the alteration was the ranking the national players into Division A and B and from then on there were 16 teams competing in a group matches and then in cross matches for the more upscale places. The alteration of competition systems and the past 16 years gave us the opportunity for testing the impact mechanisms due to the transformation.

According to our hypothesis, those national squads that display strong team cohesion with their players playing together for long years tend to be more successful internationally. We suppose that teams with stronger cohesion and more homogenic squads are more successful than those which change their team members every year. The CIES in Switzerland took the 13 seasons of the TOP 5 football leagues into consideration, examining the relationship of collected points after each season and the fluctuation within the team. They found a negative correlation – the more players they had at a team the fewer points the team collected by the end of the season, and they performed better when there were fewer changes in the player personnel. We thought stability can be observed in the player squads in question as well, therefore we examined the change of percentage composition of teams that gained medals for more years.

We supposed that successful teams primarily depend upon players who were once recruited youth national players and we also presumed that the rate of recruited youth national players increased within the squad due to the transformation of the competition systems. Our hypothesis predicted a decreasing tendency in the significance of being a national player in the careers of the players in the U20 group. At this age, the best players could appear in the national players' squad already. We supposed that we would find players who never made it to the youth competition system of the FIBA but still got medals with senior national teams.

The player data saved from the archive webpage of the FIBA ([archive.fiba.com](http://archive.fiba.com)) were first sorted out with the help of Microsoft Excel 2013 and summarized, then we generated two groups. The first group had the players who got medals in an adult competition in the research period and were able to play in the previous youth competition system (players born before 1984). In the second group we put those players who also got medals, but they could only participate in the youth national squads just after the transformation of the competition system in 2004 (players born in 1984 and later). 159 players represented the more experienced age group in the research period, the younger age group had 122 players with medals in the senior level. The subject of our research was aimed at the competition experience of recruited players. We used descriptive statistical methods to compare the generated groups. Besides their experience we also examined the age and date of birth when they first started playing and the changes of age average of the teams as well.

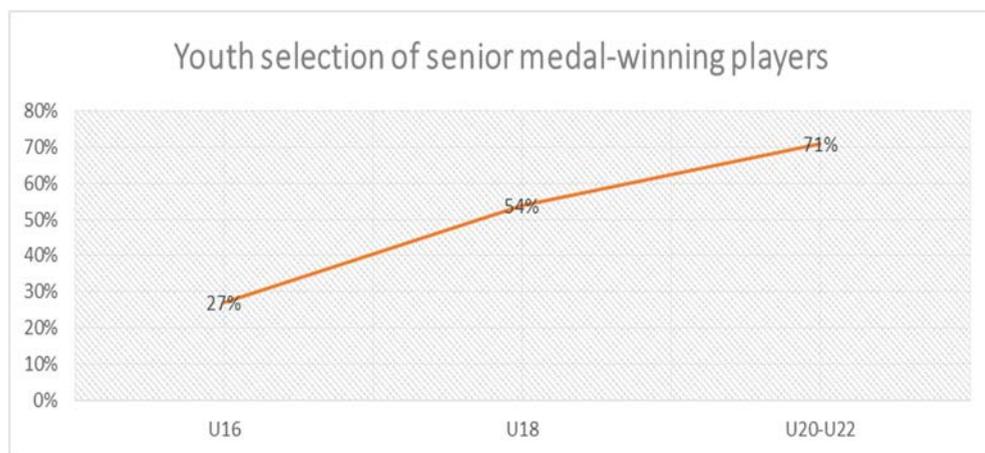
The so-called Relative Age Effect (RAE) is present in the recruitment level and so in basketball, too (Delorme et al. 2009; 2011). Integrating the data of adult players, we were curious if RAE is present in the whole sample and the two generated groups.

The most often used measures for analysing individual performance in scientific context are the game-related statistics (Sampaio et al. 2000). As it is more difficult to measure individual performance in team sports (Ericsson et al. 2003; Reilly et al. 2000), we underlined played minutes as an objective measurable unit. This is the indicator on basis of which players based on their role can be ranked.

Minutes have always been based on the decision of the head coach; the subjective, perceived usefulness of players. We generated three groups in connection with minutes: those who play many, play enough and play few minutes; the groups were defined by their minutes in their own teams. In basketball there are 12 people so selecting the team into 4-member-groups a national squad can be trisected. Our goal was to see whether there was a relationship between the youth competition experience and the minutes spent in senior world events. The Cramer Association Coefficient was used for the research the relationship between the criteria.

## Results

The following figure shows the medal winning players' eligibility for national duties in recruitment:

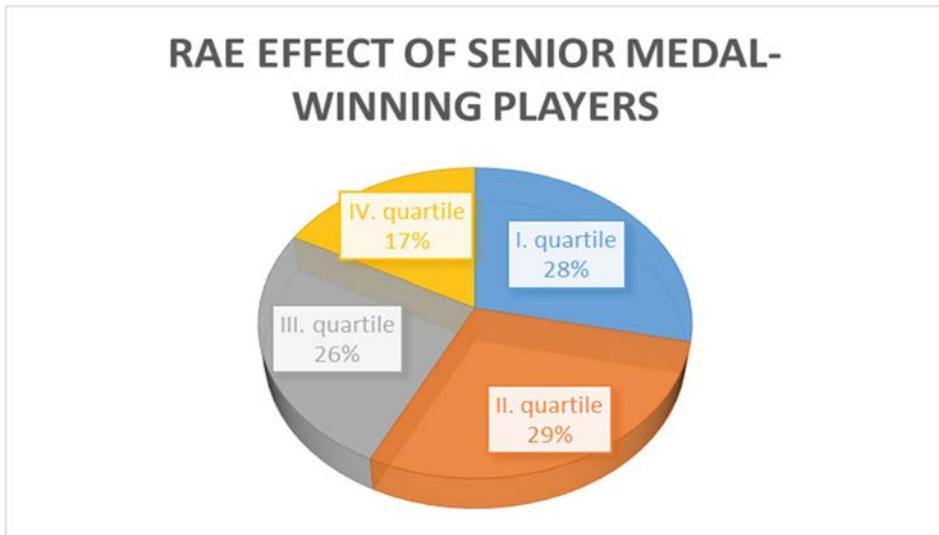


**Figure 1.** Players' eligibility for national duties in recruitment in the research period (2000-2019) (figure by the authors)

The least significant recruitment tournament is the cadet, or in its new name, the U16 championship where fewer than one third of the adult players took part. In the flattening of the line, we can state that there were fewer players who became U20 from U18 than U18 from U16. A probable explanation can be found in the fact that talented players got into the senior squads skipping the last step of the ladder, the U20. Regardless of all other rates in eligibility for national duties, performing in the U20 – which is the closest to the adult level – dominates with 71%. If we compare the players according to their age groups, there is a subtler picture.

In the more experienced players' age groups cadet eligibility was practically negligible from the viewpoint of getting into the senior national squads, fewer than one fifth of the players belonged to this age group. The steep line indicates that despite the rates which showed fewer recruitment players eligible for national duties who were born before 1984 in all age groups, the last step of recruitment was taken by much more players proportionally than players from the younger generations compared to those from the U18 group. This is probably due to fewer chances to play in the international field (international youth tournaments in every second year), and the hardship of getting into the senior national squad, so U20-U22 tournaments played a greater part in selection; it was a kind of breakout for the youth.

### Relative Age Effect, Average Age, Changes in the Framework



**Figure 2.** Medal-winning players' date of birth (figure by the authors)

The difference is less detectable between the younger players from the U18 and U20 tournaments. Prestigious international club tournaments and increased financial possibilities of the teams nowadays allow alternative individual developmental paths. The significance of the youth national team competitions shows an increasing tendency in the analysis of the framework of the adult national teams, and if we take the sample as a whole, we can see that 84% of the players participated in some recruitment national team.

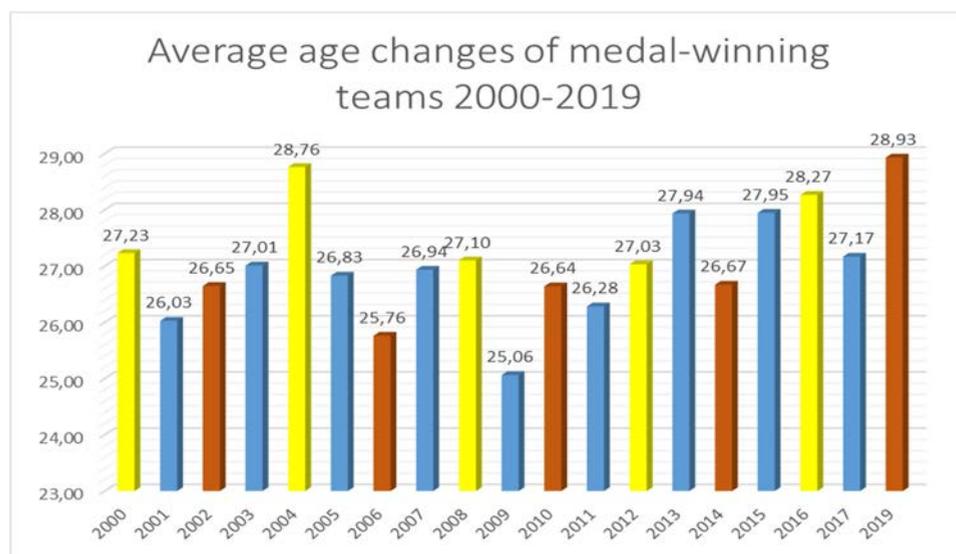
Analysing dates of birth show that 57% of the players were born in the first half of the year. As early development and the inherent selection meant advantage already in the recruitment level (Gladwell, 2008), and the players born in the first or second quarter of the year were eligible in the squads sooner.

The phenomenon can be due to fewer opportunities for competition, less flexible selection methods, less cohesion and less developed scouting system, immature individual training, and the lack of knowledge in connection of developmental paths within the team sports. The so-called relative age effect can be observed primarily with the recruitment teams, later the dates of birth quartiles were equalized in the adult level and the effect is not as strong. The reason for equalization and appearance of players (who were born in the second half of the year) in the adult national squads is the so-called 'rocky road theory' (McCarthy and Collins, 2014). Young sportsmen who were able to establish a high degree of resistance and rigidity, can make profit from their perseverance and achieve eligibility to adult national squads. Development of talent is therefore not linear, many times it can be due to traumatic effects as well (Collins and MacNamara, 2012).

Sportsmen of different sports achieve the edge of their performance in various ages, moreover, we can also differentiate the career length in certain sports as well. While there is a shorter career in some individual sports the maximum performance comes at an earlier age, in team sports it is not rare for a sportsman to achieve success permanently for more years. Gymnasts reach elite performance through early specialization and deliberate practice while on the other hand marathon runners are more likely to reach their elite performance by sampling, deliberate play and by focusing later on deliberate practice (Côté, Lidor, & Hackfort, 2009). Football researchers (CIES, 2018) examined nine years of all the European leagues and found that there is a significant correlation between the average age and the UEFA ranking of the domestic leagues. The more experienced players perform in a league the higher the given league ranked in the international level. According to the research the average age of players of teams winning the football championship was 26.5.

Below, we have examined how the average age of the involved teams in the research changed every year. We found that in the European championships (average age: 26.80) and the world championship (average age: 26.93), teams with younger players could step on the podium. The squads which got medals at the Olympic Games had a team framework with a year more experience (average age: 27.67). Since the Olympic Games is considered the highest international competition of selection, we can see the coaches' rationality and caution.

Supposedly, older players must have had more trainings and participated in more sharp competition than their older fellows that can be an important factor in setting up the national squads. Head coaches tend to change the squad's composition after a four-year period and give opportunity to younger players. In the examined period there was only one occasion when the average age of the medal-winning teams increased after an Olympics. The average age of the players in our sample were 27.07 years.



**Figure 3.** Changes in average age in medal-winning teams (figure by the authors)

In connection with the changes in average age and the observable cyclic nature we looked at the changes in the composition of the most successful European squads. In the research period the Spanish national team was the most successful in Europe. Their squad was based on well-defined player personnel. The determining players were present in all squads which won medals, the team gaining golden world championship medal in 2006 and the

team getting silver medal in the European championship in 2007 were based on in 100% of the same personnel. It is an informative piece of data that 5 players from the 2009 European Championship winner team were part of the winning team of the 2019 World Championship as well, and this is 41.6% of the squad. In case of the Spanish there were no squads which had not entered least 5 players from its previously medal-winning teams for the actual world competition. Among the most successful European teams we can find the French and Lithuanians as medal-winning teams. Although they did not achieve similar results as the Spanish, we can find the most determining players playing important roles for success from competition to competition.

Analysing the squads, we can state that we cannot figure out a universal recipe for success in connection of the average age and composition, however, the most successful national squads were mostly composed of an ideal mixture of experienced and young players. An exception is the European Championship in 2009, where Serbia won a silver medal with the youngest squad among all the medal-winning squads (22.93).

### **The Correlation between Minutes and Recruitment Eligibility**

While fighting for the final victory and the glory, teams want to be the most competitive. Reaching victory requires playing of the most qualified. From these preferences comes the fact less qualified players can spend fewer minutes in game than the more qualified ones. Therefore, the minutes of players are differentiated in performance - and victory-oriented teams (Thiel and Mayer, 2009). We started out with our supposition that coaches keep their most useful players for the longest time in game for the sake of success.

Barry M. Staw and Ha Hoang (1995) researched whether there is a phenomenon present in economy that is called 'sunk costs' in basketball. They took the NBA as a base and examined all the first and second round drafted players in seven seasons. From these players, 53 never got contracts from teams and so the sample contained 246 players. The research result showed that those players who were drafted in a higher position had contracts for longer periods with higher payment than those who were among the last on the list. Previously higher ranked players could spend more minutes in game and were trusted more even if their performance were not proportional with their payment. Those who were drafted later and so were thought to have been weaker, got fewer opportunities and were changed more often.

In our own research we were curious to see whether a preliminary piece of information as experience in junior recruitment competition impacted the decision makers. Does having a recruitment eligibility have a positive effect on

the player’s minutes in adult games, is there a correlation between the given minutes and the age-matched selections? We were looking for relationships among quality criteria, so we had a word association test done based on the Cramer associative coefficient during our test since we had more than two criterion versions. We tested the players who were never part of a youth national team and those who participated in every tournament (0.1), altogether (N=92). We put the players into three groups: player who played a lot, played enough and played little (1, 2, 3). We created the following conversion tables:

**Basic table**

|   |    |    |    |           |
|---|----|----|----|-----------|
|   | 1  | 2  | 3  |           |
| 0 | 13 | 17 | 14 | 44        |
| 1 | 18 | 10 | 20 | 48        |
|   | 31 | 27 | 34 | <b>92</b> |

**Chi-square table**

|   |          |          |          |                 |
|---|----------|----------|----------|-----------------|
|   | 1        | 2        | 3        |                 |
| 0 | 0.224914 | 1.293515 | 0.314346 | 1.832774        |
| 1 | 0.206171 | 1.185722 | 0.28815  | 1.680043        |
|   | 1.431085 | 4.479237 | 3.602496 | <b>3.512817</b> |

$$T = \sqrt{\frac{N^2}{N \cdot (n_A - 1) \cdot (n_B - 1)}}$$

Tmax = 0,8409

|            |              |
|------------|--------------|
| <b>T =</b> | <b>0,138</b> |
| <b>C =</b> | <b>0,164</b> |

**Figure 4.** Basic table, Chi-square table Cuprov and Cramer associative coefficient (figure by the author)

The Cramer associative coefficient is C=0.1643, on the basis of which we can see a weak stochastic relationship between competition experience and the played minutes in game. Most (34) of the 92 players played little, however the distribution of their minutes was normal, no players of any groups were over-represented. When we grouped the players according to their participation in the old and new competition system, important differences were explored.

From the players born before 1984, there were 17 participating in all the youth championships and from them 10 players spend much time in game as a senior medal-winner (58.82%), so in the older generation who played much with a higher chance since the system rewarded all players who had got through all the steps of recruitment (e.g. Andrei Kirilenko, Sarunas Jasikevicius). There were no significant differences in connection of the minutes of adult recruitment squads. Most of them represented players who played little, 14 of the 34-member group.

In case of players born in 1984 or later and participating in all the steps of the recruitment, we explored a conflicting thing as opposed to the older ones. The greatest group was created by those who were part of the youth recruitment squad multiple times still playing little in the adult level: 17 of 31 players (54.83%). There were altogether 7 players, who were born in 1984 or later, who had not participated in any European recruitment championships. It is especially important while analysing this age group, that from those who were not recruited in their younger years, later, in the senior level they played enough or much and were determining members of their teams. For example, we can mention Luka Doncic who is said to be one of the best players in the world. A separate research examined the recruitment eligibility of the players who spent the most time in game because of the coaches' decision. In 19 world competitions there were altogether 26 players got the most opportunities from their coaches, many of them enjoying the trust of the actual head coach (e.g. Pau Gasol). 4 of them got meaningful minutes who had never participated in the youth level. This is 15.3% of the seeded players, with a rate like that of the whole sample (15.9%). The same way, seeded players were present among those who have been to all the steps of recruitment (3 players) however, the base here was from people who were eligible for national duties but did not participate in every tournament (19 players – 73.09%). In this respect the dual nature of recruitment eligibility was proven.

## **Conclusions**

With the great competition reform of 2004, the FIBA achieved more international competition opportunities for players in the recruitment squads, players had opportunities to perform every year. Therefore, more and more players had the chance to play and develop. Our results prove that while there were players in the national squads who had not played in youth international tournaments (N=37), this number decreased spectacularly in case of younger

generations. There were altogether seven players born in 1984 or later, who got a medal in an adult competition without being a member of a youth national team.

The importance of international youth tournaments was shown since 84% of the examined players had participated in national squads sometime earlier in their lives. If we take only the senior medal winning players according to the new competition system, 94% of them had been selected to the U16, U18 and U20 events. The rate of adult sportsmen participating in youth tournaments could be supposedly higher in case of individual sports, this hypothesis can be a subject of a further research.

Talent identification programs primarily favour the early developing players (Johnston et al. 2017), however the late developers cannot be excluded since the periods of sport career and the performance ceiling can be individually different as well. Looking at the 2004 Olympic Games showed that 56% of the performing sportsmen had competed in international level first as adults (Vaeyens et al., 2009). Our results show that those who were born after 1984 and were part of the successful teams without recruitment eligibility, also played enough in their senior squads were remarkably playing much and were determining. The associative relationship between recruitment eligibility and minutes played in the adult level statistically could not be proven. The inspection of correlational relationship between the results achieved in the recruitment level and adult level can be subject to further research.

Success and performance in the recruitment age is neither sufficient nor necessary condition for the later success (Vaeyens et al., 2009). Our research shows that experience in recruitment competition (similarly to early success) is not an exclusive criteria and not sufficient preconditions for the international success later. There is a greater rate of players from youth national squads in adult level. It is assumed that these medal-winning teams have excellent supply foster systems, since it is hard to get into the adult framework from outside arrivals, however, the analysis shows that- one can get a major role with such a past and get into the senior squad.

The goal of sport associations is to ensure equal conditions for the players to achieve a long-term professional sports career; the transformations of competition system and offerings of wide range of opportunities to compete provide excellent points of reference. For the individual tailored player profiles the expanding access to developing toolbars, the sports scientific methods and statistical database can lead to further research to localize the key selection factors.

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